The invention in which an exclusive right is claimed is defined by the following:

1. A focusing system configured to focus on an object in a field of view, while there is a relative motion between the object and the focusing system, comprising:

(a) a primary optical element disposed to direct light traveling from an object passing through the field of view along a collection path, the primary optical element being selectively positionable;

(b) at least one beam splitter disposed to direct light that has traveled from an object and through the primary optical element along both a first optical path and a second optical path;

(c) a first optical grating disposed in the first optical path, the first optical grating modulating the light traveling along the first optical path to produce first modulated light having a modulation frequency proportional to a velocity of an object passing through the field of view;

(d) a first light sensitive detector on which the first modulated light is incident, the first light sensitive detector producing a first electrical signal responsive to the first modulated light;

(e) a second optical grating disposed in the second optical path, the second optical grating modulating the light traveling along the second optical path to produce second modulated light having a modulation frequency proportional to a velocity of an object passing through the field of view, the second optical grating being disposed such that light traveling from the primary optical element to the second optical grating must travel farther than light traveling from the primary optical element to the first optical grating;

(f) a second light sensitive detector on which the second modulated light is incident, the second light sensitive detector producing a second electrical signal responsive to the second modulated light; and

(g) a processor for processing the first electrical signal and the second electrical to determine a direction along which the primary optical element should be moved to improve a coincidence between a focal point of the primary optical element and an object.

2. The focusing system of Claim 1, wherein if relative positions of the first optical grating, the second optical grating, and a focal point of the primary optical element are represented in object space, the focal point is disposed between and equidistant from the first optical grating and the second optical grating.

3. The focusing system of Claim 1, wherein processor comprises an application specific integrated circuit.

4. The focusing system of Claim 1, wherein processor comprises a programmable computing device.

5. The focusing system of Claim 1, wherein the first light sensitive detector and the second light sensitive detector each comprises a photomultiplier tube.

6. The focusing system of Claim 1, wherein each optical path receives an equivalent amount of light from the object.

7. The focusing system of Claim 1, further comprising a prime mover drivingly coupled to the primary optical element, and controlled by the processor to move the primary optical element so as to improve the coincidence of the focal point of the primary optical element and an object.

8. The focusing system of Claim 7, further comprising a memory in which machine instructions and data are stored, and wherein the processor is coupled to the memory, the processor executing the machine instructions to carry out a plurality of operations, including:

(a) after processing the first electrical signal and the second electrical signal detector signal to determine a direction the primary optical element should be moved, activating the prime mover to move the primary optical element to a new position in the direction so determined, by a predefined amount; and

(b) processing the first electrical signal and the second electrical signal detector signal based on the new position of the primary optical element to determine a direction the primary optical element should next be moved to further improve the coincidence between the focal point of the primary optical element and an object; and

(c) periodically repeating operations (b) and (c).

9. The focusing system of Claim 8, wherein the machine instructions further cause the processor to manipulate at least one of the first electrical signal and the second electrical signal to determine an indication of a velocity of an object relative to the primary optical element.

10. The focusing system of Claim 1, further comprising a memory in which machine instructions and data are stored, and wherein the processor is coupled to the memory, the processor executing the machine instructions to carry out a plurality of operations, including:

(a) determine a focus signal measurement for the first electrical signal;

(b) determine a focus signal measurement for the second electrical signal;

(c) determine a velocity of an object relative to the focusing system based on the first electrical signal;

(d) determine a velocity of an object relative to the focusing system based on the second electrical signal; and

(e) determine a velocity of an object relative to the focusing system based on the focus signal measurement for the first electrical signal, the focus signal measurement for the second electrical signal, the velocity of an object relative to the focusing system as determined based on the first electrical signal, and the velocity of an object relative to the focusing system as determined based on the second electrical signal.

11. The focusing system of Claim 9, further comprising at least one additional light sensitive detector disposed to receive the light traveling along the collection path that is not modulated by either the first optical grating or the second optical grating, and which is employed to determine a characteristic of the object.

12. The focusing system of Claim 11, wherein the least one additional light sensitive detector is a time delay integration (TDI) detector logically coupled to the processor, and wherein the processor uses the indication of velocity of an object to synchronize the TDI detector to a relative motion of an object.

13. An imaging system including an auto focusing capability, employed to image an object where there is relative movement between the object and the imaging system, comprising:

(a) a primary optical element disposed to direct light from an object along a first collection path, the primary optical element being selectively positionable;

(b) a prime mover drivingly coupled with the primary optical element to selectively move the primary optical element relative to an object;

(c) splitter means disposed in the collection path, for directing light from the object along both a first optical path and a second optical path;

(d) a first collection lens disposed in the first optical path, the first collection lens having a first focal point;

(e) a first optical grating disposed in the first optical path between the first collection lens and the first focal point, the first optical grating modulating the light from an object to produce first modulated light having a modulation frequency proportional to a velocity of an object passing through the field of view;

(f) a first light sensitive detector on which the first modulated light is incident, the first light sensitive detector producing a first electrical signal responsive to the first modulated light;

(g) a second collection lens disposed in the second optical path, the second collection lens having a second focal point; such that light traveling from the primary optical element to the second focal point travels substantially the same distance as light traveling from the primary optical element to the first focal point;

(h) a second optical grating disposed in the second optical path, the second optical grating modulating light from an object to produce second modulated light having a modulation frequency proportional to a velocity of an object passing through the field of view, the second optical grating being disposed such that:

(1) light traveling from the primary optical element to the second optical grating travels farther than light traveling from the primary optical element to the second focal point; and

(2) a distance separating the first optical grating from the first focal point is substantially the same as a distance separating the second optical grating from the second focal point;

(i) a second light sensitive detector on which the second modulated light is incident, the second light sensitive detector producing a second electrical signal responsive to the second modulated light; and

(j) a controller logically coupled to the prime mover, the first light sensitive detector, and the second light sensitive detector, the controller being configured to iteratively:

(1) process the first electrical signal and the second electrical signal to determine a direction in which the primary optical element should be moved to more closely position a focal point of the primary optical element on an object; and

(2) activate the prime mover to move the primary optical element a predefined distance in the direction determined.

14. The imaging system of Claim 13, wherein each element in the first optical path is matched to a corresponding element in the second optical path.

15. The imaging system of Claim 13, wherein the controller comprises at least one of an application specific integrated circuit and a programmable computing device.

16. The imaging system of Claim 13, wherein the controller processes at least one of the first electrical signal and the second electrical signal to determine an indication of a velocity of an object relative to the imaging system.

17. The imaging system of Claim 13, wherein the controller processes the first electrical signal and the second electrical signal to determine an indication of a velocity of the object relative to the imaging system by:

(a) determining a focus signal measurement for the first electrical signal;

(b) determining a focus signal measurement for the second electrical signal;

(c) determining a velocity of an object relative to the imaging system based on the first electrical signal;

(d) determining a velocity of an object relative to the imaging system based on the second electrical signal; and

(e) determining a velocity of an object relative to the imaging system based on the focus signal measurement for the first electrical signal, the focus signal measurement for the second electrical signal, the velocity of an object relative to the imaging system as determined based on the first electrical signal, and the velocity of an object relative to the imaging system as determined based on the second electrical signal.

18. The imaging system of Claim 16, further comprising at least one additional light sensitive detector disposed to receive the light traveling along the collection path that is not modulated by either the first optical grating and the second optical grating, and which is employed to determine a characteristic of the object, said splitter means further splitting light traveling along the collection path into light traveling along a third optical path that is received by said at least one additional light sensitive detector.

19. The imaging system of Claim 18, wherein said least one additional light sensitive detector comprise a time delay integration (TDI) detector logically coupled to the controller, and wherein the controller uses the indication of velocity of the object to synchronize the TDI detector with a relative motion of an object.

20. A method for automatically focusing an imaging system on an object in a field of view while there is relative movement between the object and the imaging system, the method comprising the steps of:

(a) collecting light from the object;

(b) modulating light collected from the object to produce first modulated light having a modulation frequency that is a function of the velocity of the object;

(c) producing a first signal corresponding to an intensity of the first modulated light;

(d) modulating light collected from the object to produce second modulated light having a modulation frequency that is a function of the velocity of the object, wherein light travels from the object a greater distance before being modulated to produce the first modulated light than light traveling from the object before being modulated to produce the second modulated light;

(e) producing a second signal corresponding to an intensity of the second modulated light;

(f) processing the first signal and the second signal to determine a direction in which a focus on the object should be adjusted to improve the focus on the object; and

(g) adjusting the focus on the object in the direction determined.

21. The method of Claim 20, further comprising the step of repeating steps (a)-(g) to further improve the focus on the object.

22. The method of Claim 20, further comprising the step of manipulating at least one of the first signal and the second signal to determine an indication of a velocity of the object relative to the imaging system.

23. The method of Claim 20, further comprising the steps of:

(a) determining a focus signal measurement for the first signal;

(b) determining a focus signal measurement for the second signal;

(c) determining a velocity of the object relative to the imaging system based on the first signal;

(d) determining a velocity of the object relative to the imaging system based on the second signal;

(e) determining a velocity of the object relative to the imaging system based on the focus signal measurement for the first signal, the focus signal measurement for the second signal, the velocity of the object relative to the imaging system based on the first signal, and the velocity of the object relative to the imaging system based on the second signal.

24. The method of Claim 22, further comprising the step of using the indication of the velocity of the object to synchronize a time delay integration detector to the relative motion of the object.

25. A method for automatically focusing an imaging system on an object in a field of view while there is relative movement between the object and the imaging system, and determining at least one non velocity characteristics of the object, comprising the steps of:

(a) collecting light from the object;

(b) modulating light collected from the object to produce first modulated light having a modulation frequency that is a function of the velocity of the object;

(c) producing a first signal corresponding to an intensity of the first modulated light;

(d) modulating light collected from the object to produce second modulated light having a modulation frequency that is a function of the velocity of the object, wherein light travels from the object a greater distance before being modulated to produce the first modulated light than light traveling from the object before being modulated to produce the second modulated light;

(e) producing a second signal corresponding to an intensity of the second modulated light;

(f) processing the first signal and the second signal to determine a direction in which a focus on the object should be adjusted to improve the focus on the object; and

(g) adjusting the focus on the object in the direction determined;

(h) dispersing light collected from the object that is not modulated to produce either first modulated light or second modulated light;

(i) directing the dispersed light onto a detector disposed to receive the dispersed light; and

(j) analyzing an output signal from the detector to determine the at least one non velocity characteristic of the object.

26. The method of Claim 25, further comprising the step of repeating steps (a)-(g) to further improve the focus on the object.

27. The method of Claim 25, further comprising the step of manipulating at least one of the first signal and the second signal to determine an indication of a velocity of the object relative to the imaging system.

28. The method of Claim 25, further comprising the steps of:

(a) determining a focus signal measurement for the first signal;

(b) determining a focus signal measurement for the second signal;

(c) determining a velocity of the object relative to the imaging system based on the first signal;

(d) determining a velocity of the object relative to the imaging system based on the second signal; and

(e) determining a velocity of the object relative to the imaging system based on the focus signal measurement for the first l signal, the focus signal measurement for the second signal, the velocity of the object relative to the imaging system based on the first signal, and the velocity of the object relative to the imaging system based on the second signal.

29. The method of Claim 27, wherein the detector is a time delay integration (TDI) detector, and further comprising the step of using the indication of the velocity of the object to synchronize the (TDI) to the relative motion of the object.